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Per G. Fredriksson
University of Louisville

Muthukumara Mani

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THE POLLUTION HAVEN HYPOTHESIS

Trade Integration and Political Turbulence: Environmental Policy Consequences

Per G. Fredriksson* Muthukumara Mani†

*Southern Methodist University, pfredrik@mail.smu.edu

†The World Bank, mmani@worldbank.org

Trade Integration and Political Turbulence: Environmental Policy Consequences*

Per G. Fredriksson and Muthukumara Mani

Abstract

This paper contributes to the unresolved issue regarding the effect of economic integration on environmental policymaking. In particular, we discuss the joint impact of trade openness and political stability on environmental policymaking. Our theory predicts that the effect of trade integration on environmental policy is conditional on the degree of political stability. Trade integration affects the stringency of environmental policies due to changes in industry bribery behavior, and the effect is conditional on the degree of political stability. The empirical findings support the theory and are robust to alternative specifications. The stringency enhancing effect on environmental policy of trade integration is greater in politically stable countries.

KEYWORDS: Trade liberalization, environmental regulations, political instability, pollution haven, trade policy

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*Per G. Fredriksson is at the Department of Economics, Southern Methodist University, Box 0496, Dallas, TX 75275-0496 (pfredrik@mail.smu.edu), and Muthukumara Mani is at the Environment Department, The World Bank, MC 5-511, 1818 H St., NW, Washington, DC 20433 (mmani@worldbank.org). We would like to thank the helpful referees, Rimjhim Aggerwal, Andrea Bigano, Richard Damania, Tom Fomby, Mads Greaker, Eckhard Janeba, Michael Keen, Daniel Millimet, Muhammet Pakdil, Arvind Subramanian, Olaf Unteroberdoerster, Jim Wollscheid, participants at presentations at Göteborg University, SMU, the Industrial Research Institute, the ASSA Meetings in Atlanta, the EAERE meetings in Bilbao, and in particular the editor, Don Fullerton, for many helpful comments and suggestions. Parts of this paper were written while the first author visited the Beijer Institute at the Royal Academy of Sciences, Stockholm, and the Department of Economics, Göteborg University, Sweden. He thanks these institutions for their hospitality. Travel support from SMU is also gratefully acknowledged. The views expressed in this paper are those of the authors and not those of the World Bank. The usual disclaimers apply.

This paper examines how increased economic integration influences the determination of environmental policies in countries with unstable political regimes.

The relationship between trade policy and environmental policy and quality is an unresolved issue in the scholarly and public debate. For example, Antweiler et al. (2001) and Dean (2002) find that trade liberalization, on the whole, is likely to improve environmental quality. Others argue that trade openness threatens environmental goals (see Esty and Geradin, 1998). The current discussion on the effects of economic integration on environmental policymaking has risen to the forefront of the public debate in part due to the well-publicized protests at recent major trade negotiation meetings (for example, at the WTO meeting in Seattle in 1999).[1]

Nonetheless, economic integration is progressing rapidly in several regions of the world, for example in the southern cone of Latin America (MERCOSUR), Asia (AFTA), North America (NAFTA), Europe (EU), and negotiations are under way for a Free Trade Area of the Americas (FTAA). However, some fundamental questions are still being asked, both in developed and developing economies, on the implications of further economic integration. In particular, does trade liberalization affect governments' ability to manage economic activity, i.e. does it limit governments' freedom of action on regulatory policies such as on the environment? If this would be the case, trade liberalization would contribute to creating "pollution havens".

When analyzing the effect of trade liberalization on environmental policymaking, we believe it beneficial to take domestic political conditions into account. It is often argued that political instability has large adverse economic and social effects, especially in countries where the government is driven by short-term motives, supporting narrow interest groups, and ignoring long-term costs (see, e.g., Rodrik, 1991).

While the effects of economic integration and political instability have been studied in separate strands of the literature, no attempt has been made to study the *interaction* between them (on economic integration see, for example, Fredriksson, 1999; Antweiler et al., 2001; and Dean, 2002; on political instability see, for example, Bohn and Deacon, 2000; Brett and Keen, 2000; and Fredriksson and Svensson, 2003).[2] We

[1] In the context of increasing globalization of capital flows, some observers have argued that gaps in national environmental standards draw the most polluting industries to developing countries, creating "pollution havens" and propelling a global "race to the bottom" in environmental standards (see Wilson, 1996, for a survey). Esty and Geradin (1998, p.7) argue that: "considerable evidence suggests that government officials, facing the prospect of reduced sales, lost jobs and diminished investment in domestic industries caused by competition with foreign companies whose costs are lower due to more lax environmental requirements, often choose not to elevate environmental standards and sometimes even relax enforcement of current standards."

[2] Antweiler et al. (2001) study the effect of trade openness on pollution levels, and show theoretically and empirically the scale, composition, and technique effects of trade liberalization. In their study, all countries will set stricter environmental policies due to real income increases following trade liberalization, but the total effect depends on factor endowments. On average, the pollution levels decline, however. Copeland (1994, 1996) investigates the welfare effects of trade and environmental policy reforms, Copeland and Taylor (1994, 1995) discuss the linkages between income, pollution, and trade, López (1997) analyzes the effect of trade liberalization on environmental resources (biomass) and deforestation in Ghana, Rauscher (1994), Bommer and Schulze (1999), Fredriksson (1999), and Damania

aim to close this gap in the literature. We seek to shed light on whether the effects of trade openness and political stability reinforce each other, or whether their impacts instead are opposed.

Our focus is on the impact of trade liberalization on the political forces forming environmental policy, in particular in the presence of domestic political instability. Our theoretical model builds on Bernheim and Whinston's (1986) and Grossman and Helpman's (1994) common agency model, which recently has been extended to environmental policymaking by, for example, Damania (2001).[3] In our model, a lobby group representing the polluting industry aims to influence the incumbent government's environmental policy choice by promising a bribe (or campaign contribution) in return for a favorable policy decision. The incumbent government values both the bribe and aggregate social welfare, and the relative weight on welfare is viewed as a useful measure of government corruptibility.[4] We focus the discussion on relatively dishonest (corrupt) regimes, which put a great weight on bribes relative to social welfare.

In a three-stage small open economy model, we analyze the effects of economic integration on the behavior of the incumbent government and a producer lobby group. In the first stage, the government receives a bribe schedule by the lobby group, which relates the size of the bribe to the attractiveness of the government's environmental policy choice. When formulating its bribe offer, the lobby takes the probability of eventual policy implementation into account, i.e. the level of political stability. For policy implementation to occur, the incumbent government must remain in power throughout the (third) policy implementation stage. In the second stage, the government chooses its optimal environmental policy, taking into account its own turnover probability. It receives in return a bribe corresponding to its policy choice. In the third stage, the environmental policy previously selected by the government is implemented, given that it remains in power. The political crisis causing the departure of the government could take the form of, for example, a coup d'etat or a vote of no

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et al. (2003) study the effect of trade liberalization on environmental policymaking, the latter in the presence of corruption. Hillman and Ursprung (1994) study the effect of environmental lobby groups on trade and environmental policies. These papers ignore political stability, however. Bohn and Deacon (2000) study the effect of ownership security (a function of political violence and instability) on deforestation and oil extraction, Brett and Keen (2000) explore politicians' incentive to earmark pollution tax revenues in the presence of political uncertainty, and Fredriksson and Svensson (2003) study the interaction between corruption and political instability on agricultural sector environmental policies. This literature ignores the issue of trade liberalization. Thus, no previous study exists on the joint effects of trade openness and political stability on environmental policymaking.

[3] While several authors in the literature use the basic structure of Grossman and Helpman's (1994) model to study environmental and trade policies, the joint effects of trade integration and political instability have not been analyzed using this common agency model.

[4] While in some countries the transfer of funds to politicians is legal (e.g., campaign contributions from political action committees in the U.S.), in this paper we view all monetary gifts to the government corruption. Corruption here implies that the policy maker is willing to deviate from a welfare maximizing policy in return for monetary gifts from a lobby group.

confidence. If the incumbent government's policy is not implemented, the lobby group does not benefit from the bribe paid in the second stage.[5]

In this paper, we show that trade integration affects both the producer lobby's and the government's incentives in the policy formation process, and that these incentives are conditional on the degree of political stability.[6] We find that trade integration in a polluting sector has two effects on the pollution tax. First, as output falls, the lobby has less at stake and its bribery effort declines accordingly. This "bribery reduction effect" of trade integration causes the pollution tax to rise. Second, note that the government has a welfare maximizing incentive to tax excess output and pollution created by protection. This incentive declines as a result of trade integration, a "welfare effect". When the government is sufficiently dishonest (corrupt), the bribery reduction effect dominates. In this case, trade integration raises the pollution tax. The model also predicts that the effect of trade integration is conditional on the degree of political stability.

Since political instability reduces both the lobby's incentive to seek influence, and the government's incentive to deliver welfare, the changes in the intensities of these motives resulting from trade integration are moderated by political instability. In the limit when political stability is extremely low, trade integration has close to no effect on environmental policy, because both the bribery and welfare effects of trade integration are negligible. This is a novel finding in the literature, to our knowledge.

The prediction generated by the model is evaluated using cross-country data from 92 non-OECD and 26 OECD countries. Our empirical work supports our theory, since we find that trade openness is associated with more stringent environmental policy. This suggests that the "bribery reduction effect" dominates the "welfare effect". We also find that the marginal effect of openness is conditional on the degree of political stability. In particular, the stringency enhancing effect of trade integration on environmental policy is *greater* in more stable countries. Our empirical results are robust to several alternative measures of the degree of economic integration and political stability. We believe they may serve to inform the policy debate of the likely effects on environmental policymaking of further trade integration.

The paper is organized as follows. Section 1 sets up the theoretical model and Section 2 discusses the effects of trade integration and political stability on environmental policy. Section 3 presents our empirical model and data, and Section 4 discusses the empirical results. Section 5 offers a brief conclusion.

[5] In other words, bribe payments are not conditional on the policy being implemented and there is no legal recourse forcing the return of given bribes. Another implicit assumption is that a government dislodged from power will not seek reelection, and hence has no incentive to either placate the lobby or address welfare questions (see also Coate and Morris, 1999).

[6] Rose (2004) reports that GATT/WTO members do not appear to be more open to international trade, and we therefore disregard the possibility that reductions in trade barriers are reciprocal.

1. The Model

A small open economy has two sectors. The "clean" sector produces a numeraire good z, and the polluting sector produces a good x. The economy is populated by two types of individuals, consumers (denoted by S) and factor owners (F). The two population groups are of size s and f, respectively, and the population is normalized to 1. We assume that the factor owners are a highly concentrated group such that their share of the population is approximately zero, i.e. f=0 and s =1. All individuals have labor income, factor owners in addition have factor income from ownership of a sector-specific factor. The consumers derive disutility from the pollution associated with the local production. An individual k, k=$S,F,$ has a utility given by[7]

$$U^k = c^{zk} + u^k(c^{xk}) - \delta^S \theta X, \tag{1}$$

where c^{zk} and c^{xk} are consumption of the numeraire good z and good x by a type k, with world market prices equal to 1 and p^w, respectively. The world market price p^w is exogenously given as the country is a price taker. $u(c^{xk})$ is a strictly concave and differentiable sub-utility function. δ^S is an indicator variable which takes a value of one if the individual is a consumer, and zero otherwise.[8] While s is defined as the share of consumers in the total population, it is also the marginal disutility of pollution, since the share s has disutility 1 and the others have disutility 0. Production of x is given by X, and θ is the per-unit damage function. The government regulates pollution by levying a pollution tax $t \in T$, $T \subset \Re$, on each unit of damage from polluting production activities. If the polluting sector is import-competing (exporting), it benefits from an ad-valorem import tariff (export subsidy), τ.[9] Whereas the pollution tax is set by the government (relatively few pollutants are covered by international agreements), the tariff is assumed determined entirely by multilateral trade negotiations which this small country government is unable to influence. All individuals thus take the tariff rate as given.[10] Let subscripts denote partial derivatives. The per-unit damage is a function of the amount of abatement, A, carried out per unit of output, such that $\theta = \theta(A)$, where $\theta_A < 0$, and $\theta_{AA} > 0$.

An individual k spending Y^k consumes c^{xk}=$d(p^w(1+\tau))$=u_c^{-1} and c^{zk}=Y^k-$p^w(1+\tau)d(p^w(1+\tau))$, where $d(.)$ is the demand function for good x. Thus, the indirect

[7] Corner solutions may result with quasi-linear preferences. We assume interior solutions, however.

[8] Our results would be unaltered if we assumed that factor owners also suffered disutility from pollution, as long as they remain in favor of a lower pollution tax. We opt to keep the model as simple as possible.

[9] From now on we discuss only the import-competition (tariff) case, since import competing sectors generally receive more protection. Identical results hold in the case of an exporting sector with an export subsidy. Note that export taxes are illegal in some countries, for example the U.S. We therefore ignore the issue of export taxes, although we recognize that they are used in some developing countries.

[10] The exogeneity assumption is supported by our empirical findings, see Section 3 below. Moreover, as pointed out by Ederington (2000), the success of GATT negotiations in reducing worldwide tariff barriers has resulted in a shift of attention to domestic policy instruments as secondary trade barriers.

utility function of a consumer is expressed as $V^S(p^w,\tau,Y^S)=Y^S+C(p^w(1+\tau))-\theta X$, where $C(p^w(1+\tau))= u[d(p^w(1+\tau))]-p^w(1+\tau)d(p^w(1+\tau))$ is the consumer surplus derived from consumption of good x. There is no consumer surplus from consumption of good z.

Each individual has a unit of labor and the total labor endowment equals l. Good z is produced by labor alone with a constant returns to scale technology, and an input-output coefficient equal to one. The labor supply is sufficiently large for the supply of this good to be positive which implies a wage rate equal to one. The inputs into production of good x are labor and a sector-specific factor. The technology is constant returns to scale. Ignoring labor costs, producers of good x face a net price given by $p = p^w(1+\tau) - t\theta(A) - A$, and the specific factor reward depends entirely on the producer's net price, p, i.e. $\pi(p)$. The first-order condition with respect to abatement equals $\pi_A = -X(t\theta_A + 1) = 0$, which in turn is used to find $A_t = -\theta_A/(t\theta_{AA}) > 0$. The supply curve for good x is given by Hotelling's Lemma, i.e. $X(p) = \pi_p(p)$, where $X_p > 0$, and $X_{pp} = 0$.[11] Imports of the polluting good are given by $M(p) = p^w[d(p^w(1+\tau)) - X(p)]$. Net aggregate tax and tariff revenues are given by

$$R(t,\tau) = t\theta X(p) + \tau M(p), \tag{2}$$

and are assumed distributed equally to all individuals as lump-sum.

The income obtained by the owners of the sector-specific factor depends on the environmental policy (as well as on trade policy). Factor owners are assumed able to organize into a lobby group that coordinates a prospective bribe offer to the incumbent government. The consumers are assumed to face sufficiently severe free-riding problems to be unable to organize political action (see Olson, 1965). The model defines a three-stage game between the government and the lobby. Both players are risk neutral. The timing assumptions are as follows:

Stage 1. In stage one the lobby group offers the incumbent government a bribe schedule $\Lambda(t)$. The lobby's strategy hence consists of a continuous function $\Lambda(t): T \to \Re$, i.e., it offers a specific bribe for selecting a policy t. The lobby faces uncertainty on whether the incumbent government will remain in power long enough for the lobby to reap a reward to its bribe (policy implementation occurs only in stage three). In stage one, the lobby assigns a probability $0 < \gamma < 1$ that the government will remain in office, and a probability $(1-\gamma)$ that it will thrown out. Thus, γ is a measure of the degree of political stability. All players also assign a probability $0 < \lambda < 1$ that the chosen policy is implemented by the *new* government, in the event the incumbent leaves office early.[12] We make a simplifying assumption about this parameter. **Assumption 1:** The probability λ is small.[13]

[11] This assumption simplifies the presentation of our theoretical results, but does not change them.

[12] Fredriksson and Svensson (2003) make an identical assumption. For example, the new government may have other policy priorities before the next election, the process of hiring new officials in charge of

Stage 2. In the second stage the incumbent government proceeds to set its optimal environmental policy, given the lobby group's strategy. The government also collects the associated bribe from the producer lobby.[14] Bribes are used for the incumbent politicians' personal consumption during this stage.

Stage 3. In the third stage, the selected policy is implemented, given that the incumbent government remains in power, or in the event that the successor keeps the policy selected by its predecessor. Producers determine output and abatement levels. Turnover could occur, for example, because of a vote of no confidence, or a coup attempt. From the lobby's perspective in stage one, policy implementation occurs with a probability $\gamma + (1-\gamma)\lambda$. This is the probability that all policy-favors "purchased" by the lobby will be delivered. With a probability $(1-\gamma)(1-\lambda)$ the incumbent is removed from office and the policy is not implemented.[15] For simplicity, the game between the lobby and the incumbent simply ends here in this event. Since the challenger did not receive a bribe within the period, it is not committed to its predecessor's policy promises, although it may choose to implement its predecessor's policy choice. In the event the challenger decides to change the predecessor's environmental policy in stage three, the new government is assumed to set an exogenous tax t^c, until a new lobbying game starts between itself and the lobby.

The lobby takes the political stability level into account in its formulation of its bribe schedule. The gross (indirect) utility of the lobby group is therefore given by the expected value of specific factor income,

$$E[\Omega^F(t,\tau)] \equiv \pi(p)[\gamma+(1-\gamma)\lambda]+\pi(p^c)(1-\gamma)(1-\lambda), \tag{3}$$

where $E[.]$ is the expectations operator and $\pi(p)$ is aggregate factor income. This factor income is received in the event that the policy determined by the incumbent materializes. Since $f = 0$, the lobby ignores tax and tariff revenues, as well as consumer surplus (it receives a negligible share). If the incumbent government is

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carrying out environmental policy and the process of agenda setting may involve delays, or the government may want to avoid that environmental policy becomes an election issue. Thus, we view the new government as having an objective function identical to the incumbent, but due to some exogenous circumstance it may delay the taking of bribes in return for environmental policy choices.

[13] This assumption implicitly implies that the new government must care sufficiently about receiving a bribe in return for setting environmental policy.

[14] Neither the lobby group, nor the government, is assumed to renege on their promises in the second or third stages. Since corrupt government politicians likely have a monopoly on selling policy favors, it appears plausible that they have a relatively great bargaining power, and are able to demand that a bribe must be paid before any industry friendly policy action is taken. Our timing assumption also sharpens the focus on the considerate resources that industry groups invest in political connections and bribery, which is supported by empirical evidence.

[15] We abstract from possible strategic choices by the lobby, and we do not model the bribery game between the lobby and the new government. While it would be preferable to include the new government's actions into the model, we opt to keep it as simple as possible and thus focus on the incumbent government policy choice only.

removed and the successor chooses a different policy, the lobby's exogenous factor income equals $\pi(p^c)$, where $p^c = p^w(1+\tau) - t^c\theta(A)-A$.

The incumbent government values bribes and aggregate social welfare. Bribes are used for personal consumption, and social welfare is of relevance because the incumbent is more likely to win future re-election, the greater is average welfare. However, aggregate welfare is assumed of value to the incumbent government only if it stays in office. The incumbent government's policy choice influences its own welfare only if it stays in power, in which case aggregate social welfare is given by

$$\Omega^A(t,\tau) \equiv \pi(p) + l + C(p^w(1+\tau)) + R(t,\tau) - s\theta X(p), \tag{4}$$

which expresses the sum of all individuals' aggregate factor rewards, labor income, consumer surplus, tax and tariff revenues, take the consumers' aggregate disutility from pollution. Note that taking the first-order condition of the expression for aggregate social welfare, (4), yields the second-best tax, $t^* = s + \tau p^w X_p \theta / (\theta^2 X_p - \theta_A A_t X) > s$, where s is the first-best pigouvian tax (i.e., under free trade). Since the presence of a tariff stimulates output, the optimal tax exceeds the marginal disutility of pollution, s. If the incumbent government loses power, it has no interest in aggregate social welfare, and from the incumbent government's point of view it equals zero.

The incumbent government thus has an objective function equal to

$$E[I(t,\tau)] \equiv \Lambda(t) + h\gamma\Omega^A(t,\tau), \tag{5}$$

a weighed sum of the bribe and the expected aggregate social welfare. The exogenous parameter h is the government's weight on welfare relative to bribes, which in our view reflects the degree of government honesty (absence of corruption). In our model, the bribe aims to influence government policy and not elections (see also Schulze and Ursprung, 2001; Fredriksson and Svensson, 2003). López and Mitra (2000) employ a similar formulation in their investigation of the effect of corruption on the relationship between income and environmental quality. The government trades off the size of the bribe (which it enjoys with probability 1) with the expected value of aggregate social welfare.

The subgame perfect Nash equilibrium in the well-known model by Grossman and Helpman (1994) can be found using two necessary conditions:

(i) $$t^\circ = \arg\max_t \Lambda^\circ(t) + h\gamma\Omega^A(t,\tau) \text{ on } \mathrm{T};$$

(ii) $$t^\circ = \arg\max_t [\Omega^F(t,\tau) - \Lambda^\circ(t)] + [\Lambda^\circ(t) + h\gamma\Omega^A(t,\tau)] \text{ on } \mathrm{T}.$$

The equilibrium pollution tax policy t° simultaneously maximizes the government's utility function [condition (i)] and the joint utility of the lobby and the

incumbent [condition (ii)], given the turnover probability. The equilibrium characterization is found by taking the first-order conditions of (i) and (ii), which yields

$$\Lambda_t^{\circ}(t^{\circ}) + h\gamma\Omega_t^A(t^{\circ},\tau) = 0, \tag{6}$$

and

$$[\Omega_t^F(t^{\circ},\tau) - \Lambda_t^{\circ}(t^{\circ})] + [\Lambda_t^{\circ}(t^{\circ}) + h\gamma\Omega_t^A(t^{\circ},\tau)] = 0. \tag{7}$$

Substituting (6) into (7) yields $\Omega_t^F(t^{\circ},\tau) = \Lambda_t^{\circ}(t^{\circ})$, which reflects the fact that the bribe schedule is locally truthful, as discussed by Grossman and Helpman (1994). The characterization of the equilibrium pollution tax is found by substituting this condition into (6), which yields

$$\Omega_t^F(t^{\circ},\tau) + h\gamma\Omega_t^A(t^{\circ},\tau) = 0. \tag{8}$$

Differentiation of equations (3) and (4) with respect to the pollution tax yields

$$\Omega_t^F(t,\tau) = -\theta X(\gamma + (1-\gamma)\lambda), \tag{9}$$

and

$$\Omega_t^A(t,\tau) = (t-s)(\theta_A A_t X - \theta^2 X_p) + \tau p^w X_p \theta. \tag{10}$$

Substituting expressions (9) and (10) into equation (8), and rearranging, we find an explicit expression for the equilibrium characterization given by

$$\underbrace{-\theta X[\gamma + (1-\gamma)\lambda]}_{A} + \underbrace{h\gamma[(t^{\circ}-s)(\theta_A A_t X - \theta^2 X_p) + \tau p^w X_p \theta]}_{B} = 0. \tag{11}$$

Note that the second term in (11) is adjusted by γ, rather than $(\gamma + (1-\gamma)\lambda)$, since the incumbent government does not benefit from its policy choice in the event it leaves office. Note also that the equilibrium tax rate t° is smaller than the second-best tax, which the government would choose in the absence of instability and lobbying. Since term *A* in (11) is negative, term *B* is positive, which holds only if $t^{\circ} < s + \tau p^w X_p \theta \big/ (\theta^2 X_p - \theta_A A_t X)$.

2. Trade Integration and Political Stability

We now analyze the effects of trade integration on environmental policymaking, accounting for political stability. Note that "trade integration" in our analysis is identical to a cut in the tariff rate. The aim is to derive testable hypotheses for our empirical work carried out in the subsequent sections. We find the following proposition.

Proposition 1: (*i*) *In equilibrium, trade integration unambiguously causes the pollution tax rate to rise when* (*a*) *the degree of government honesty is low, or* (*b*) $(s-t)\theta_A A_t > \theta$; (*ii*) *The effect is conditional on the degree of political stability. For sufficiently low government honesty, the effect is increasing in political stability.*

Proof: (*i*) Differentiation of Eqn. (11) with respect to the tariff equals

$$\frac{\partial t^{\circ}}{\partial \tau} = \frac{\{\theta\overbrace{[\gamma + (1-\gamma)\lambda]}^{A} - h\gamma\overbrace{[(t-s)\theta_A A_t + \theta]}^{B}\}X_p p^w}{|D|}, \tag{12}$$

where $|D| = \theta^2 X_p[\gamma + (1-\gamma)\lambda] + h\gamma\psi,$ and where $\psi \equiv \{(\theta_A A_t X - \theta^2 X_p) + (t-s)[X(\theta_{AA}A_t^2 + \theta_A A_{tt}) - 3\theta\theta_A A_t X_p] + \tau p^w X_p \theta_A A_t)\}$. $|D|$ is the second-order condition of the government's maximization (8), which is required to be negative for a maximum. We assume this to be the case, which requires $\psi < 0$. The denominator of (12) is consequently negative. In the numerator, term *A* is positive, whereas term *B* is ambiguous in sign. We have two cases: (a) Term *B* is positive. For sufficiently low values of honesty, *h*, (equivalent to sufficiently *high* corruption), such that $h < \theta[\gamma + (1-\gamma)\lambda]/\{\gamma[(t-s)\theta_A A_t + \theta]\}$, the numerator is positive and thus expression (12) is negative. Trade integration leads to an increase in the pollution tax if government honesty is sufficiently low. (b) Term *B* is negative. In this case, (12) is unambiguously negative for all values of *h*. Thus, trade integration leads to an increase in the pollution tax.

(*ii*) Differentiation of (12) yields

$$\frac{\partial^2 t^\circ}{\partial \pi \partial \gamma} = \underbrace{\frac{\overbrace{\{\theta(1-\lambda) - h\overbrace{[(t-s)\theta_A A_t + \theta]}^{A}\}}^{B} X_p p^w}{|D|}}_{I}$$

(13)

$$\underbrace{-\frac{\overbrace{\overbrace{(\theta^2 X_p(1-\lambda) + h\psi)}^{C}\{\theta\overbrace{[\gamma + (1-\gamma)\lambda]}^{E} - h\gamma[(t-s)\theta_A A_t + \theta]\}}^{F} X_p p^w}{|D|^2}}_{II}.$$

The sign of (13) is indeterminate. We seek to evaluate the sign of (13), focusing on parts *I* and *II* separately (one at a time). The focus is on the role of *h* and cases where (13) is negative. ***Part I***: (a) If term *A* in the numerator is negative, term *B* is unambiguously positive for all values of *h*. (b) If term *A* is positive, term *B* in the numerator is positive for sufficiently low honesty, such that $h < \theta(1-\lambda)/[(t-s)\theta_A A_t + \theta]$. **Part *II*:** Term *C* is positive (negative) for $h < (>)\theta^2 X_p(\lambda - 1)/\psi$. Term *E* is positive (negative) if $h < (>)\theta[\gamma + (1-\gamma)\lambda]/\gamma[(t-s)\theta_A A_t + \theta]$, when $[(t-s)\theta_A A_t + \theta] > 0$. Term *E* is unambiguously positive when $[(t-s)\theta_A A_t + \theta] < 0$. Term *F* is positive if *sign* (term *C*) = *sign* (term *E*).

Expression (13) shows how the effect of trade openness on the pollution tax $(\partial t^\circ / \partial \tau)$ is affected by a change in political stability, γ. For sufficiently low honesty *h*, terms *B*, *C*, and *E* are positive, yielding a negative sign of (13). In this case (see part (*i*) of the proposition), greater political stability raises the effect of trade integration on the pollution tax. However, (13) is negative also with a high *h* and $[(t-s)\theta_A A_t + \theta] > 0$, such that terms *C* and *E* are negative and thus *F* is positive. In this case, if part *II* dominates part *I* in absolute value, or when part *I* is negative, (13) is negative.

In sum, for sufficiently low *h*, $\partial^2 t^\circ / (\partial \pi \partial \gamma) < 0$, such that the effect of trade integration on the pollution tax is increasing with political stability. For other values of *h*, we know only that $\partial^2 t^\circ / (\partial \pi \partial \gamma) \neq 0$, i.e. the effect of trade integration on the pollution tax is conditional on political stability. ■

The intuition is the following.[16] (*i*) In this model, trade integration (a cut in the tariff rate) has two effects on environmental policy, and their size both depend on the degree of political stability. Term *A* in the numerator of (12) represents the reduction in the producers' incentive to seek a lower pollution tax as a result of trade integration

[16] The result is independent of environmental policy instrument used. With an emissions standard, trade integration would still result in a "bribery reduction effect" and a "welfare effect". Revenues do not drive our result. Note that an identical result is obtained if the trade policy used is an export subsidy.

(note from (9) that term A is the second derivative $\Omega_{t\tau}^{F}$). When output shrinks, less is at stake for the lobby in the political process. Thus, the bribe offer is reduced, and the pollution tax rises through this channel. We denote this the "bribery reduction effect" of trade integration.

Term B in the numerator of (12) reflects the change in the government's incentive to tax pollution for welfare reasons (note from (10) that term B is the second derivative $\Omega_{t\tau}^{A}$). As discussed above, the tariff introduces distortions in production and consumption, and increases the aggregate level of pollution damage. In this small open economy, only one policy instrument is available to address these distortions: the pollution tax. As discussed above, the second-best pollution tax therefore exceeds marginal damage, i.e. $t^{*} > s$. Trade integration reduces the marginal incentive to tax pollution for this reason. However, the net effect on the pollution tax is ambiguous, because of taxpayers' interest in tax revenues and the effect on profits. We denote this the "welfare effect" of trade integration.[17] If term B in (12) positive, the relative importance of the two effects (represented by terms A and B in (12), respectively) depends on the degree of honesty, h. In particular, when the degree of government honesty is low (corruption is high) such that $h < \{\theta[\gamma + (1-\gamma)\lambda]\}/\ \{\gamma[(t-s)\theta_{A}A_{t} + \theta]\}$, the bribery reduction effect dominates the welfare effect and trade integration raises the pollution tax. If term B is negative, trade integration unambiguously raises the pollution tax.

(*ii*) The two effects discussed above are adjusted for the probability of successful eventual policy implementation, reflected by the level of political stability, γ. Bribery and social welfare are important (to the lobby and the government, respectively) only as long as the government stays in power long enough to deliver and reap the benefit of its policy choice. In addition, the lobby also benefits from bribery to the extent that a new government would implement the policy paid for (without extra cost), which occurs with probability $(1-\gamma)\lambda$.

Changes in γ affect $\partial t^{\circ}/\partial\tau$ both via its impact on the "bribery reduction effect" and on the "welfare effect". For low government honesty, h, terms B, C, and D in (13) are all positive, and thus (13) is negative. In this case, the effect of γ occurs via the "bribery reduction effect", since welfare in this case is of minor importance. The main effect is here that political stability raises the lobby's incentive to offer a sizeable bribe. Changes in this incentive due to trade integration are therefore more pronounced with greater political stability.

For high levels of honesty, all terms in (13) have ambiguous sign, and the relative impact of political stability on the (i) bribery reduction effect and (ii) the welfare effect determines the sign of $\partial^{2}t^{\circ}/(\partial\tau\partial\gamma)$. Greater political stability implies

[17] Note that since trade integration shrinks the pollution intensive sector, environmental damage falls, given the pollution tax. A falling pollution tax would therefore not necessarily be welfare-reducing. Our focus is on the determination of the pollution tax, however, and we abstract from welfare issues in this paper.

that social welfare is of greater concern to the incumbent government. As discussed above, trade integration lowers the incentive to tax pollution for second-best welfare reasons, and this incentive-reducing effect is relatively stronger where political stability is high.

3. Empirical Specification and Data

The theoretical model developed in the previous sections yields testable implications of the relationships between trade openness (trade integration), political stability, and environmental policy formation, expressed in Proposition 1. Our objective is to test these implications using cross-country data on environmental policy. Proposition 1 shows that for low levels of government honesty, trade integration raises environmental policy stringency, and this effect is stronger the greater the degree of political stability. However, the same outcome may occur also for high levels of honesty, and our empirical work will also seek to determine the sensitivity of our results to the level of government honesty.

The empirical estimation can be formulated as follows,

$$t_i = \boldsymbol{x}'_i\beta^x + \beta^\gamma\gamma_i + \beta^\tau\,\tau_i^{-1} + \beta^{\gamma\tau}\,\gamma_i\tau_i^{-1} + \beta^h h_i + \varepsilon_i, \tag{14}$$

where t_i is the stringency of environmental policy in country i, $\boldsymbol{x_i}$ is a vector of controls, γ_i is the degree of political stability, τ_i^{-1} is the degree of trade openness (the inverted tariff rate), h_i is government honesty (absence of corruption), and ε_i is a zero mean error term. Whereas β^γ, β^τ, $\beta^{\gamma\tau}$ and β^h are coefficient scalars, β^x is a coefficient vector.

We now describe the variables used to test the prediction generated by our theory. Table 1 summarizes the descriptive statistics of variables used in the regression. Table A.1 in the Appendix contains a further description of the data and sources.

Our measure of the stringency of environmental regulations is a sub-index from the *2001 Environmental Sustainability Index* (ESI) developed by CIESIN (2001). We employ one of the core indicators as our measure of the stringency of environmental policies for 2000, which we denote **Environmental Stringency**. This is an aggregation of various indicators consisting of regulation and management, private sector responsiveness, science and technology, capacity for debate, environmental information, and eco-efficiency. It captures the extent to which the country has in place institutions and policies that result in effective responses to environmental problems (i.e., laws on the book, implementation, monitoring, and enforcement). It takes values between 0 and 100, where a higher value implies greater environmental policy stringency.[18]

[18] To our knowledge, our dependent variable is the best measure of environmental policy stringency available for a large number of countries during the time period studied.

Table 1.A. Descriptive Statistics: Full Sample

Variable	Number of Observ.	Mean	Standard Deviation	Minimum	Maximum
Environmental Stringency	118	46.94	18.38	18.1	92.3
Log (GDP)	114	8.37	1.09	6.2	10.3
Openness	113	2.78	1.19	1.0	5.0
Dishonesty	77	5.32	2.35	0.0	8.3
Honesty	113	0.02	0.91	-1.6	2.1
Political Stability	113	0.06	0.82	-2.4	1.7
% Non-Ag Labor	117	63.06	27.57	5.9	98.8
Economic Freedom	99	6.60	1.41	3.7	9.1
Democracy	86	0.23	0.42	0.0	1.0
Federal	86	0.20	0.40	0.0	1.0
War Dummy	98	0.30	0.46	0.0	1.0
Civil War Dummy	98	0.27	0.44	0.0	1.0
Common Law	86	0.29	0.46	0.0	1.0
Racial Tension	87	3.72	1.62	0.0	6.0
Ethno-religious Fractionalization	97	0.44	0.23	0.0	0.9
Ethno-linguistic Fractionalization	98	0.33	0.30	0.0	0.9
Civic Freedom	118	3.51	1.64	1.0	7.0
Dismag	77	0.55	0.39	0.0	1.0

Table 1.B. Descriptive Statistics: Developing Country Sample

Variable	Number of Observ.	Mean	Standard Deviation	Minimum	Maximum
Environmental Stringency	92	39.63	10.98	18.1	72.9
Log (GDP)	88	7.96	0.85	6.2	9.8
Openness	87	2.43	1.13	1.0	5.0
Dishonesty	51	6.53	1.27	2.7	8.3
Honesty	87	-0.35	0.55	-1.6	1.3
Political Stability	87	-0.21	0.67	-2.4	1.1
% Non-Ag Labor	92	56.38	26.91	5.9	98.8
Economic Freedom	73	6.10	1.25	3.7	8.4
Democracy	60	0.05	0.22	0.0	1.0
Federal	60	0.13	0.34	0.0	1.0
War Dummy	72	0.38	0.49	0.0	1.0
Civil War Dummy	72	0.33	0.47	0.0	1.0
Common Law	60	0.33	0.48	0.0	1.0
Racial Tension	61	3.25	1.51	0.0	6.0
Ethno-religious Fractionalization	71	0.49	0.22	0.0	0.9
Ethno-linguistic Fractionalization	72	0.40	0.31	0.0	0.9
Civic Freedom	92	4.01	1.43	2.0	7.0
Dismag	51	0.53	0.40	0.0	1.0

Political stability is not directly observable. However, a measure of political stability has been developed by Kaufmann *et al*. (1999a, 1999b) for the years 1997-98. The **Political Stability** index combines several indicators seeking to measure perceptions of the likelihood that the government in power will be destabilized or overthrown. It takes values from –2.5 to 2.5, where a higher value represents greater political stability. We also use **Racial Tension** as an alternate measure of political (in-)stability (Knack and Keefer, 1995). It is an index for countries experiencing racial tension and takes values from 1 (high tension) to 6 (low tension).

Our trade openness measure is an index developed by the Heritage Foundation and the *Wall Street Journal* (O'Driscoll *et al.*, 2000) (**Openness**). An economy earns a 5 if it has an average tariff rate of ≤4% and/or has very few non-tariff barriers, and a 1 if the average tariff rate is >19% and/or there are very high non-tariff barriers that virtually prohibit imports. Thus, we expect that **Openness** will take a positive sign. We also use a more comprehensive (general) measure of economic liberalization and openness, the **Economic Freedom** index, compiled by the Fraser Institute (Gwartney *et al.,* 2000). The **Economic Freedom** index is a composite index of ten individual indices for 1997. It takes values between 0 and 10, where a higher value for the index indicates a greater degree of economic liberalization and freedom.

A main implication of our theory is that the effect of trade integration is conditional on the degree of political stability. We therefore include the relevant interaction variables **Openness×Political Stability** and **Economic Freedom×Political Stability**.

We have two proxies for government honesty. One is an index developed by Kaufmann *et al*. (1999a, 1999b), **Honesty**.[19] It measures perceptions of honesty in government in a country, or more precisely, the absence of the use of public power for private gain. The index takes values from –2.5 to 2.5, where a higher value implies more honesty, and thus we expect a positive sign. Our second government honesty measure is the Corruption Perceptions Index (**Dishonesty**) developed by Transparency International, which measures the "perceptions of the degree of corruption as seen by business people, risk analysts, and the general public." The index is computed as the sample average of a number of different surveys assessing each country's performance. **Dishonesty** ranges between 0 (perfectly clean) and 10 (highly corrupt).[20] We expect a negative sign.

Proposition 1 suggests that the level of government honesty may play a role for the effect of openness on environmental policy, and the interaction effect with -political stability. To investigate the impact of government honesty on the relationships of interest, we therefore experiment with different cut-off values for **Honesty**.

[19] The indicator reflects the statistical compilation of perceptions of the quality of governance of a large number of survey respondents in industrial and developing countries, as well as non-governmental organizations, commercial risk rating agencies, and think tanks during 1997 and 1998.

[20] The index is inverted in the scale from the original data by subtracting values from 10 to make results more intuitive. A number of recent empirical studies of corruption have employed this index, including Persson et al. (2000), Fisman and Gatti (2002), and Fredriksson et al. (2004).

Given the possible endogeneity of the **Honesty**, **Political Stability**, and **Openness** variables, OLS is expected to lead to biased results. We therefore test for the necessity of an instrumental variable approach (whether the set of estimates obtained by least squares are consistent or not) by using an augmented regression test (the Durbin-Wu-Hausman test) (Davidson and MacKinnon, 1993). This is carried out by including the residuals of each endogenous right-hand side variable as a function of all exogenous variables in a regression of the original model.[21] A smaller p-value for **Honesty** and **Political Stability** in our model indicates that they are endogenous and that OLS is inconsistent. However, trade openness was found to be *exogenous* and hence can be treated as predetermined. We correct for the endogeneity of corruption and political stability by using Two-Stage Least Squares (2SLS). We also test for possible heteroskedasticity and correct it using White's correction.[22]

Our theoretical model, as well as the previous empirical literature (see, for example, Fredriksson and Svensson, 2003), is informative concerning control variables to include in regression (14). Two sets of controls capture demand factors and structural features of an economy that may influence environmental policy in alternative ways that are not the focus of the present paper. We thus include the log of purchasing power adjusted per capita GDP, **Log GDP**.

Industrial environmental policies are also influenced by the workers employed in polluting sectors. The greater their stake in the policy outcome, the greater their political pressure and success. However, Olson's (1965) theory of free-riding implies that political influence may decline as the size of an interest group increases. We use the proportion of the total labor force working in non-agricultural sectors (**% Non-Ag. Labor**) as our measure of worker political pressure on industry environmental policies. The labor force here comprises all individuals who meet the International Labor Organization's definition of the economically active population. The expected sign is indeterminate. The remaining control variable seeks to adjust for structural differences between countries.[23]

Given the endogeneity of **Honesty**, **Dishonesty** and **Political Stability**, we use a number of instrumental variables to test and correct for the bias. For example, La Porta et al. (1999), Fisman and Gatti (2002), and Persson et al. (2003) discuss factors determining corruption. We model the determinants of government honesty into two main categories, namely standard economic controls, and political and legal history. Based on the literature, we selected the following instruments: a dummy for common law system (**Legal Origin**) from La Porta et al. (1999) (also used by Fredriksson and Svensson, 2003), an indicator of the federal nature of government (**Federation**) (see Fisman and Gatti, 2002), and a variable measuring electoral district magnitudes

[21] This is an augmented form of the Hausman test for contemporaneous correlation between the error term and the regressors, used to test exogeneity of variables (Hausman, 1983).
[22] See White (1980) and Greene (1997) for White's correction to standard errors for an unknown form of heteroskedasticity.
[23] We do not include a measure of the marginal damage from pollution since this will be determined by environmental policy.

(**Dismag**). **Dismag** comes from Persson et al. (2003) who argue that electoral competition becomes stiffer in countries with single-member districts than in countries with a single nation-wide district. As a result, candidates become more focused and disciplined and hence demonstrate less rent seeking behavior and more honesty.

We hypothesize that political stability is to a large extent a function of the prevailing economic, political and social factors. We use **Racial Tension, Ethno-religious Fractionalization**, dummies for countries with recent history of **War** and **Civil War** as our instruments for **Political Stability**. The test of over-identifying restrictions was applied to the various sets of instruments. It indicates that our instruments are valid.[24]

4. Empirical Results

We empirically test our model for a sample of 118 countries for which the **Environmental Stringency** variable is available, of which 92 are non-OECD countries. Table 2 presents the first-stage regressions for **Dishonesty**, **Honesty**, and **Political Stability**, identifying various instruments. They are able to explain a large portion of the variation in **Dishonesty**, **Honesty**, and **Political Stability**. A number of instruments are significant at conventional levels, in addition to the level of income (**Log GDP**). **Dishonesty** is driven by the degree of decentralized structure of government (**Federal Dummy**), consistent with the literature suggesting that a federal structural of government adds further layers of bureaucracy and increases rent seeking opportunities. The existence of common law system (**Legal Origin**) appears to reduce **Dishonesty** levels, consistent with earlier research findings which suggest that 'civil law' countries with higher expected duration of judicial proceedings, less consistency, less fairness in judicial decisions and more corruption compared with 'common law' countries (see Djankov et al., 2002).[25] The **Honesty** equation suggests that curtailing basic civic rights may reduce government honesty by vesting power in a few hands.

Political Stability appears to be associated primarily with low levels of ethno-religious fractionalization and racial tension, and higher levels of economic development. This is consistent with the literature which argues that that ethnic and religious fractionalization proxies for the degree of conflict in society, which fuels political instability (see Annet, 2001).

The estimation results for the **Environmental Stringency** equation for the full sample are presented in Table 3. The models contain estimates from both OLS and 2SLS regressions using different controls. The OLS results are presented for comparison. The results suggest that the point estimates for our key variables such as **Openness** and **Political Stability** are more robust and significant at higher levels when

[24] The order condition necessary for identification is satisfied since the **Dishonesty**, **Honesty** and **Political Stability** equations are over-identified.

[25] La Porta et al. (1999) and Fredriksson and Svensson (2003) have previously found that legal origin is a good instrument for the degree of corruption.

Table 2: First Stage Regressions

Variable	Dishonesty	Honesty	Political Stability
Log GDP	-2.04 (6.1)***	0.91 (7.2)***	0.44 (3.4)***
War Dummy			-0.17 (1.3)
Civil War Dummy			-0.21 (1.1)
Ethno-religious Fractionalization			0.74 (2.8)***
% Non-Ag. Labor	0.01 (0.4)	-0.007 (1.2)	-0.002 (0.4)
Openness	-0.09 (0.6)	0.06 (1.0)	0.04 (0.6)
Federal Dummy	0.69 (1.8)*	-0.17 (1.18)	
Racial Tension			0.14 (2.6)***
Dismag	-0.10 (0.2)	-0.13 (0.7)	
Legal Origin	-1.44 (3.8)***	0.46 (3.1)***	
Civic Freedom		0.32 (2.0)*	
Constant	23.3 (11.0)***	-7.38 (9.61)***	-4.34 (5.3)***
R^2	0.716	0.750	0.585
Observations	77	79	87

Notes: t-statistics in parenthesis. *(**) [***] statistically significant at the 10 (5) [1] percent level.

the endogeneity is taken into account.[26] The results support our theory and the estimates appear robust under alternate specifications. Moreover, all variables that are statistically significant have the expected sign.

The **Openness** and **Economic Freedom** variables are significant across most models, indicating that countries with more liberal trade policies, which are more economically integrated with the rest of the world, tend to set more stringent environmental policies. First, protection tends to worsen pollution because it stimulates output. Tariff reduction (**Openness**) by itself reduces output and pollution, which makes

[26] As Table 2 reveals, we are able to explain a large portion of the variation in **Dishonesty** and **Political Stability** in our first stage regressions.

it less profitable to bribe the government to reduce stringency. Thus, the "bribery reduction effect" of trade openness is to make environmental policy more stringent. In the opposite direction, because openness reduces the need for domestic production of the polluting good, the "welfare effect" means a lower need for stringent environmental policy. The empirical finding is that liberal trade policies lead to more stringent environmental policies. This indicates that the bribery reduction effect of trade integration dominates the welfare effect.

To gain an understanding of the full effect of trade openness on environmental policy, we need to consider the interaction effect identified by our theory. The interaction variables **Openness×Political Stability** and **Economic Freedom×Political**

Table 3: Environmental Stringency Regressions (OLS and 2SLS)

Variable	**OLS**				**2SLS**		
Log GDP	5.39 (2.3)**	4.42 (2.6)**	4.07 (2.1)**	3.15 (1.5)	3.18 (0.8)	3.80 (1.0)	1.91 (0.4)
Dishonesty	-4.52 (7.3)***		-4.05 (6.6)***	-4.99 (9.3)***	-3.42 (2.4)**	-2.10 (1.1)	
Honesty		12.75 (7.8)***					8.86 (2.2)**
% Non-Ag. Labor	-0.11 (1.7)*	-0.11 (2.3)**	-0.06 (1.0)	-0.01 (0.2)	-0.05 (0.5)	-0.02 (0.3)	-0.03 (0.0)
Openness	2.26 (2.1)**	2.73 (3.5)***		-0.98 (0.6)	3.74 (2.3)**		3.71 (2.3)**
Economic Freedom			2.95 (3.2)***			3.86 (3.6)***	
Political Stability	-10.72 (2.3)**	-6.10 (7.8)***	-17.62 (2.3)**		-20.77 (3.9)***	-51.33 (4.6)***	-20.3 (3.8)***
Racial Tension				-3.83 (2.7)***			
Openness× Polit. Stability	3.82 (2.9)***	2.34 (2.2)**			8.38 (4.8)***		8.17 (4.6)***
Ec. Freedom× Polit. Stability			2.68 (2.5)**			7.99 (5.2)***	
Openness× Racial Tension				1.23 (2.8)***			
Constant	29.70 (1.7)*	8.47 (2.2)**	21.77 (1.6)	56.18 (3.5)***	31.7 (0.9)	1.82 (0.0)	19.0 (0.6)
R^2	0.870	0.853	0.879	0.884	0.818	0.856	0.816
Observations	76	107	74	69	68	68	68

Notes: t-statistics in parenthesis. *(**) [***] statistically significant at the 10 (5) [1] percent level.

Stability are positive and significant in all models. Thus, the effect of **Openness** is *conditional* on the level of **Political Stability**. As the degree of trade integration rises, so does the stringency of environmental policy, and this is *particularly* true in politically stable countries. The reduction of industry bribery as a result of trade integration is particularly strong when influence-seeking and bribery takes place under predictable (stable) political conditions. Using **Racial Tension** as a proxy for political (in-)stability in the fourth column, our results largely continue to hold. **Openness×Racial Tension** is significant, although **Openness** becomes insignificant when this interaction term is included.

To see the complete effect of **Political Stability**, we also need to consider its interactions. For example, using the estimates from the 5th model (5th column) of Table 3 (2SLS), we find that ∂**Environmental Stringency**/∂**Political Stability** = 2.53 (= -20.77 + 8.38×2.78) (evaluated at the mean of **Openness**). That is, political stability is

Table 4: Environmental Stringency Regressions: Developing Countries

Variable	**OLS**			**2SLS**	
Log GDP	4.82 (1.9)*	2.73 (1.2)	2.91 (1.4)	3.52 (0.8)	2.58 (0.5)
Dishonesty	-4.16 (4.4)***	-4.3 (4.8)***	-4.14 (5.6)***	-2.74 (1.6)	-2.85 (1.3)
% Non-Ag. Labor	-0.13 (1.9)*	-0.07 (1.3)	-0.03 (0.5)	-0.05 (0.5)	-0.04 (0.3)
Openness	2.98 (2.7)***		-0.27 (0.2)	5.14 (3.2)***	
Economic Freedom		3.52 (3.2)***			4.08 (2.9)***
Political Stability	-8.63 (1.7)*	-17.89 (2.1)**		-17.90 (3.0)***	-48.48 (3.4)***
Racial Tension			-3.94 (2.9)***		
Openness× Political Stability	3.05 (1.8)*			6.73 (2.5)**	
Economic Freedom× Political Stability		2.49 (2.0)*			7.44 (3.5)***
Openness× Racial Tension			1.31 (2.7)***		
Constant	31.4 (1.5)	30.58 (2.0)*	51.97 (3.0)***	22.34 (0.6)	15.78 (0.3)
R^2	0.761	0.781	0.817	0.738	0.733
Observations	52	50	46	45	45

Notes: t-statistics in parenthesis. *(**) [***] statistically significant at the 10 (5) [1] percent level.

associated with greater environmental policy stringency, except in relatively closed economies (where the total marginal effect turns negative).

Turning to our control variables, **Dishonesty** and **Honesty** are significant across the models with the expected signs, suggesting that lower levels of corruption are associated with stricter environmental policies. **Log GDP** is significant in only some of the OLS regressions, as is **% Non-Ag. Labor**.[27] This may suggest that the variables of main interest are relatively important determinants of environmental policy.[28]

Table 4 replicates Table 3 using only the developing country observations. Policy advice may have particular relevance for this group of countries. In addition, this group of countries has a lower average of Honesty, and these regressions may consequently shed some light on the role of the honesty variable for the direction of the interaction in focus (see the discussion in connection with Proposition 1). We find that **Openness** and **Economic Freedom** are associated with more stringent environmental policies in developing countries, and again this is particularly the case where political

Table 5: Environmental Stringency Regressions: Varying Corruption Levels

	OLS			**2SLS**		
Sample Range Dishonesty Index	**5-10**	**4-10**	**2-10**	**5-10**	**4-10**	**2-10**
Log GDP	5.30 (2.36)**	5.20 (2.4)**	5.83 (2.6)**	1.51 (0.3)	0.75 (0.2)	2.22 (0.5)
Dishonesty	-1.91 (1.3)	-1.89 (1.5)	-3.92 (4.2)*	-2.10 (1.0)	-2.3 (1.5)	-3.1 (2.0)**
% Non-Ag. Labor	-0.12 (1.7)*	-0.10 (1.6)	-0.12 (1.8)*	-0.02 (0.3)	0.01 (0.1)	-0.01 (0.1)
Openness	2.90 (2.9)***	2.60 (2.7)**	2.36 (2.3)**	3.46 (3.1)***	3.70 (3.3)***	4.01 (3.2)***
Political Stability	-8.51 (1.6)	-8.35 (1.8)**	-9.92 (2.0)**	-12.1 (3.0)***	-12.0 (3.0)***	-17.5 (3.9)***
Openness× Political Stability	3.60 (2.3)**	3.53 (2.60)**	3.57 (2.60)**	3.90 (3.0)***	3.96 (3.1)***	5.98 (3.8)***
Constant	12.0 (0.7)	12.7 (0.7)	22.3 (1.2)	35.0 (0.8)	41.2 (1.1)	34.2 (0.9)
R^2	0.526	0.591	0.742	0.561	0.585	0.721
Observations	50	58	65	42	49	56

Notes: t-statistics in parenthesis. *(**) [***] statistically significant at the 10 (5) [1] percent level.

[27] To adjust for structural differences between countries, we also tried including an OECD country dummy. This was insignificant in all regressions.

[28] This can also be interpreted that the traditional Kuznets type results may not hold when structural variables such as dishonesty and political stability are controlled for. This is a topic for future research.

stability is high. The only difference between Tables 3 and 4 appear to be that **Dishonesty** is insignificant in both 2SLS models, possibly due to insufficient variation.

To further explore the impact of honesty for our main results, we performed a sensitivity analysis for our regressions of main interest. The samples used in Table 5 are determined by the countries' **Dishonesty** scores. We used three different cut-off levels of **Dishonesty** (i) 5-10; (ii) 4-10; (iii) 2-10, where the first sample contains only the most dishonest countries. Table 5 reveals that our main results appear quite insensitive to the **Dishonesty** scores. **Openness** and its interaction with **Political Stability** remain significant and positive in all models. **Dishonesty** is here significant only in the largest samples (including countries with **Dishonesty** index 2-10).

5. Conclusion

This paper develops a theory of how environmental policy formation is affected by the degree of economic integration and the level of political turbulence. The prediction that emerges is that trade integration is associated with stricter environmental policies in countries with relatively corrupt governments, and this effect may occur also in less corrupt countries. Moreover, the theory predicts an interaction effect between the degree of trade integration and the level of political stability.

These predictions are supported by our empirical findings from developed and developing countries. Trade integration leads to more stringent environmental policies, and the effect is greater in politically stable countries. Our findings suggest that predictions of environmental policy outcomes in connection to trade reform programs should take the degree of political stability into account.

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Appendix

Table A.1. Variable Definitions and Data Sources

Variable	Definition and Source
Environ-mental Stringency	Captures the extent to which the country has in place institutions and policies that result in effective responses to environmental problems. It takes values between 0 and 100, where a higher value implies greater environmental policy stringency. Source: Center for International Earth Science Information Network (2001), www.ciesin.org.
GDP	GDP Per Capita (PPP) or Purchasing power adjusted GDP is obtained when GDP is converted to international dollars using purchasing power parity rates. An international dollar thus has the same purchasing power over GDP as the U.S. dollar in the United States. Source: World Development Indicators (2000).
Dishonesty	Corruption Perceptions Index published by Transparency International, describes the level of perceived corruption in the public sector using a poll of political risk indexes. Original scores range from 0 (completely corrupt) to 10 (clean). Average of CPI indexes for years 1997, 1998, and 1999. The index is inverted in scale by subtracting values from 10 to make the results more intuitive. Available at: www.transparency.de.
Honesty	Measures perceptions of honesty (absence of corruption) corruption in a country, or more precisely, the absence of the use of public power for private gain. The index takes values from –2.5 to 2.5, where a higher value implies greater control over corruption. Source: Kaufmann et al. (1999a, 1999b).
Political Stability	Measures perceptions of the likelihood that the government in power will be destabilized or overthrown. Takes values from –2.5 to 2.5, where a higher value represents greater political stability. Source: Kaufmann et al. (1999a, 1999b).
Openness	Index of trade openness developed by the Heritage Foundation and the *Wall Street Journal*. Takes values from 1 to 5. An economy earns a "5" if it has average tariff rate of less than or equal to 4 percentage points and/or has very few non-tariff barriers, and "1" if the average tariff rate is greater than 19% and/or there are very high non-tariff barriers that virtually prohibits imports. Source: O'Driscoll et al. (2000).
% Non-Ag. Labor	Proportion of the total labor force recorded as working in non-agricultural sectors. Source: World Development Indicators (2000).
Economic Freedom	Measure of economic liberalization and openness. A composite index of ten individual indices for 1997. Takes values between 0 and 10, where a higher value indicates a greater degree of economic liberalization and freedom. Source: Gwartney et al. (2000).
Racial Tension	Index for countries experiencing racial tension. It takes values from 1 (high tension) to 6 (low tension). Source: Knack and Keefer (1995).
Dismag	A measure of the average number of representatives elected in each district taking values between 0 and 1. 0 represents a system with only single-member districts, 1 a system with a single electoral district. Persson et al. (2003).
Federal Dummy	Federal structure dummy variable. It takes the value 1 for federation, and 0 otherwise.
Legal Origin	Legal Origin Dummy taking the value 1 for countries with history of Anglo-Saxon Common Law, and 0 otherwise. Source: La Porta et al. (1999).
Civic Freedom	Index that indicates the freedom enjoyed by the civil society. Take a value from 1 (most free) to 7 (least free). Source: Gwartney et al. (2000).
War Dummy	Dummy variable which takes the value 1 if the country was involved in at least one incidence of war in the last 30 years, 0 otherwise. Source: Knack and Keefer (1995).
Civil War Dummy	Civil war dummy variable taking the value 1 if the country experienced civil war in the last 30 years, 0 otherwise. Source: Knack and Keefer (1995).